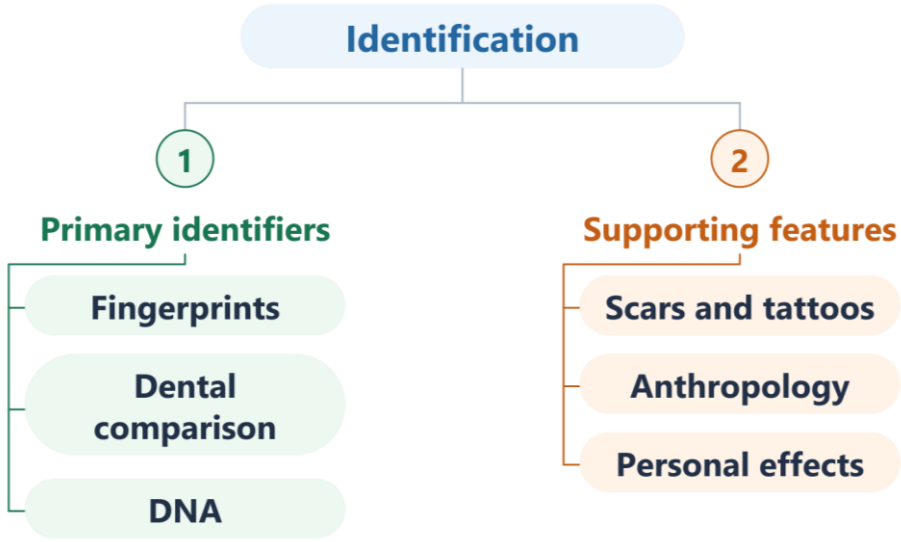
Forensic Medicine and Toxicology - Topic 4 - Clinical forensic medicine – identification

Establishing Identity



Identity and Corpus Delicti

Identification and Corpus Delicti

- **Identification** establishes who a person is by comparing reliable information from the person or remains with appropriate reference information.
- **Corpus delicti** means the essential facts showing that an offence occurred, not simply the presence of a dead body.
    - In a suspected unlawful death, identification and proof of the death's circumstances are related but distinct questions.

Uses and Limitations of Identification

- The identification of a living person may be needed for treatment, legal examination, missing-person investigation or a disputed personal record.
- Identification of the deceased supports lawful investigation, family notification and respectful return of remains.
- A photograph or a relative's visual recognition can be helpful but may be unreliable after severe injury, burning or decomposition.

Primary and Supporting Identifiers

- **Fingerprints, dental comparison and DNA** are principal scientific identification methods in disaster-victim identification.
- Scars, tattoos, medical implants, previous radiographs, clothing and personal possessions may provide important supporting information.
- A positive conclusion requires appropriate comparison rather than merely finding that a feature is common to both the unknown person and a missing person.

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- A discrepancy must be explained scientifically rather than ignored to obtain a desired match.

Respectful Description of Personal Features

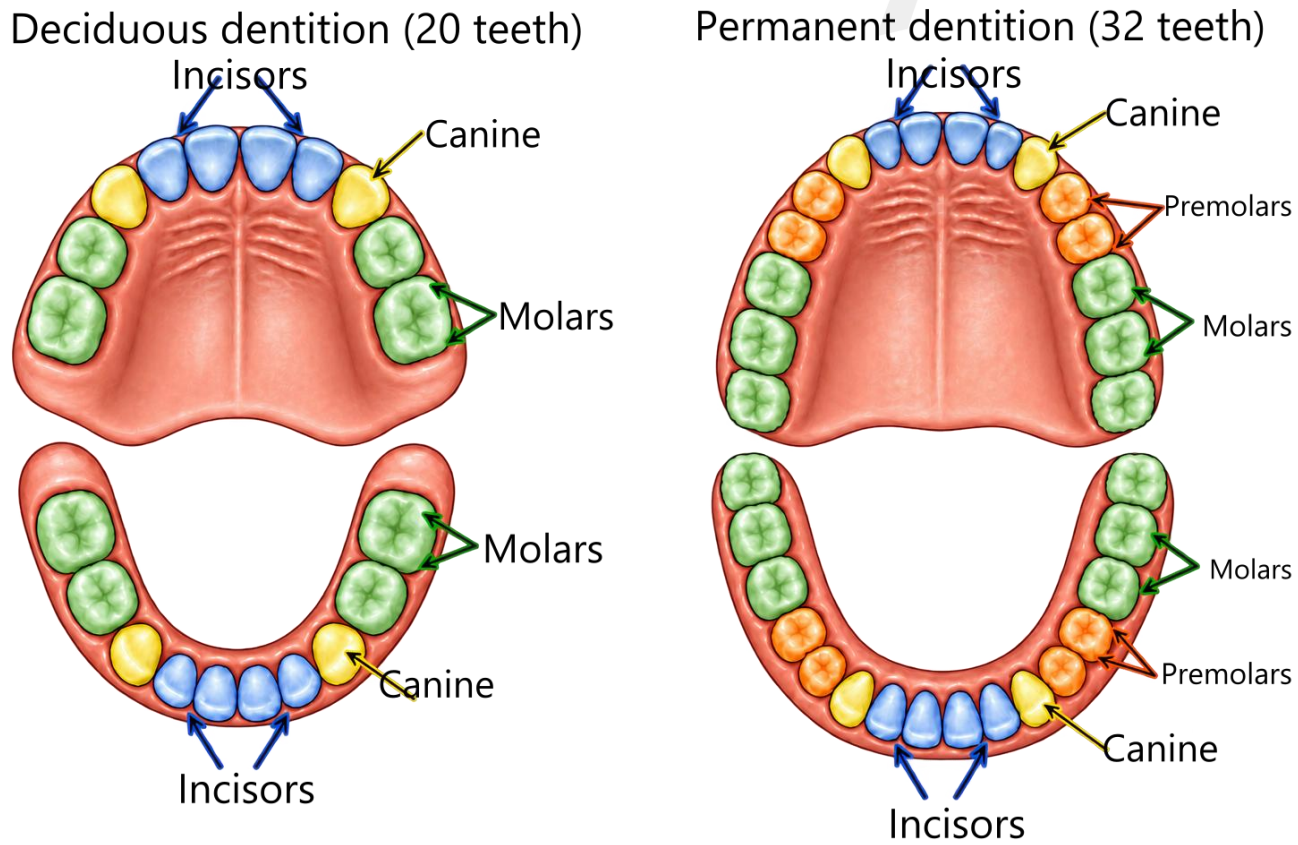
Identity, Sex Characteristics and Gender

- Record observable features accurately and use the person's stated identity when the person can provide it.
- Biological sex-related assessment, gender identity and sexual orientation are different concepts.
- Skeletal or genetic observations do not by themselves establish a person's gender identity.

Limits of Appearance and Skeletal Inference

- Skin colour, facial appearance or an assumed racial category cannot reliably determine nationality, caste, religion or criminal propensity.
- Ancestry assessment from skeletal features is probabilistic and population-dependent, and it must not be presented as a rigid biological race classification.
- Religious clothing, a tattoo or circumcision may suggest a line of inquiry but cannot prove religion.
- Stature should be measured directly when possible, while skeletal estimates require a validated method and an uncertainty range.

Teeth and Dental Identification



Primary and permanent dentition in dental identification

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The Two Dentitions

- The complete **deciduous dentition** contains 20 teeth.
- Each deciduous quadrant contains two incisors, one canine and two molars.
- The complete **permanent dentition** may contain 32 teeth when all third molars are present.
- Each permanent quadrant contains two incisors, one canine, two premolars and three molars.
- Deciduous molars are replaced by permanent premolars, while permanent molars erupt behind the primary teeth.

1. Deciduous Teeth

- The primary dental formula for one side of both jaws is 2 incisors, 1 canine and 2 molars in each quadrant.
- The calculation is 5 teeth × 4 quadrants = 20 teeth.

2. Permanent Teeth

- The permanent formula is 2 incisors, 1 canine, 2 premolars and 3 molars in each quadrant.
- The calculation is 8 teeth × 4 quadrants = 32 teeth when all third molars are present.

Eruption and Development

Primary, Mixed and Permanent Dentition

- The first primary teeth often appear around six months, and the primary dentition is generally complete by about three years.
- Permanent first molars and incisors commonly begin to erupt around six years.
- Mixed dentition means that primary and permanent teeth are both present.
- Most permanent teeth other than third molars erupt during later childhood and early adolescence.

Variability and Radiographic Assessment

- Third molar development and eruption are highly variable, and some people lack one or more third molars.
- A reference chart gives a distribution of usual development rather than an exact birthday for an individual.
- Dental radiographs may show formation and root development before eruption is visible in the mouth.

Useful Approximate Eruption Sequence

A. Primary Tooth Eruption

- Primary central incisors commonly erupt during the second half of the first year, with substantial individual variation.

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- Primary first molars commonly erupt during the second year, canines afterwards, and second molars complete the primary set around the third year.

B. Permanent Tooth Eruption

- Permanent first molars commonly erupt at 6–7 years and do not replace a primary tooth.
- Permanent incisors usually erupt between about 6 and 9 years, and premolars and canines broadly between about 9 and 12 years.
- Permanent second molars commonly appear around 12–14 years.
- Third molars are much more variable and commonly appear in late adolescence or later, if they erupt at all.
- These are broad teaching ranges; age certification requires validated development assessment and appropriate records.

Dental Records and Decay

- Record missing teeth, restorations, root treatments, prostheses, unusual tooth position and relevant radiographic findings.
- Compare these with authenticated ante-mortem records using an appropriate dental numbering system.
- Dental caries is influenced by diet, hygiene, fluoride exposure and access to care and is not a dependable measure of chronological age.
- Tooth loss must be distinguished from non-eruption, congenital absence and post-mortem loss.
- Teeth may protect material useful for DNA analysis, but the laboratory should guide destructive sampling.

Dental Age Estimation in Adults

- After tooth development is complete, adult dental age estimation mainly uses changes that accumulate with age rather than eruption alone.
- The method should be selected according to whether the person is living, whether an extracted tooth is available, and the condition of the remains.

Gustafson's Method

➢ **Gustafson's method** assesses six regressive changes in an adult tooth, classically using a ground section.

Criterion	Change assessed
Attrition	The biting or chewing surface shows progressive wear.
Periodontosis	The periodontal attachment recedes, exposing more of the root.

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Criterion	Change assessed
Secondary dentine	Dentine deposited with age reduces the size of the pulp space.
Cementum apposition	Additional cementum accumulates on the root surface.
Root resorption	Resorptive changes affect the root, particularly its apex.
Root transparency	The apical root dentine becomes increasingly translucent.

- Each change is scored from 0 to 3 according to its degree, and the six scores are added.
- The total is related to age through a regression equation; the historical Gustafson equation is age in years = 11.43 + 4.56 × total score.
- This historical equation is not universally accurate, and an equation validated for the examined population and tooth type is preferable.

Other Adult Dental Methods

A. Lamendin's Method

- **Lamendin's method** uses root translucency and periodontal recession in relation to root length in an adult single-rooted tooth.

B. Kvaal's Method

- Radiographic methods, such as **Kvaal's method**, assess the reduction in pulp size relative to tooth dimensions caused by secondary dentine deposition.

C. Cementum Annulation

- **Cementum annulation** uses incremental lines in tooth-root cementum, together with the estimated age of root formation, to estimate chronological age.

D. Aspartic Acid Racemisation

- Biochemical methods include **aspartic acid racemisation** in dentine, in which age-related changes in amino-acid configuration are compared with calibrated reference material.

E. Morphological Tooth-Wear Assessment

- Morphological methods may also evaluate tooth wear, but diet, occupation and dental habits can produce large differences between people of the same age.

Value and Limitations

- Teeth resist decomposition and may remain available when other structures are poorly preserved.
- Histological methods that require tooth removal or sectioning are destructive and are mainly relevant to extracted teeth or post-mortem material.

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